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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,710	04/08/2004	Michael Wayne Graham	546322000304	1697

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EXAMINER	
SCHNIZER, RICHARD A	
ART UNIT	**PAPER NUMBER**
1635	

DATE MAILED: 06/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/821,710	GRAHAM ET AL.	
	Examiner	Art Unit	
	Richard Schnizer, Ph. D	1635	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *44,47,48 and 56-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *44,47,48 and 56-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/646,807.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/21/05;6/30/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The Examiner in charge of this Application has changed. Please direct further correspondence to Richard Schnizer, Art Unit 1635, whose contact information can be found at the end of this Action.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/21/05 has been entered.

Claims 1-43, 45, 46, 49-55, and 62-76 have been canceled by amendments over the course of prosecution.

Claims 44, 47, 48, and 56-61 remain pending and are under consideration in this Office Action.

Priority

The claims as originally filed were drawn to an RNA sequence limited to about 20-100 nucleotides in length, and were accorded a filing date of 8 April 2004 because the claimed priority documents did not support this limitation. It was asserted in the Office Action of 2/8/05 that the closest support was found in the second full paragraph

on page 8 of the instant application which states, "[n]ormally, a sequence of greater than 20-100 nucleotides should be used, though a sequence of greater than about 200-300 nucleotides would be preferred...", which teaching is the same as the teachings found in the priority documents. The Office Action asserted that the skilled artisan would not have viewed this statement as teaching that the nucleic acid of the invention should be limited to between about 20-100 nucleotides. In contrast, the statement teaches away from the limitation, actually indicating that the nucleic acids of the invention should be greater than this range. Thus, the skilled artisan would not have viewed the parent applications as providing descriptive support for the invention as claimed in the instant application. Therefore, the instant application is considered a continuation-in-part of the parent applications and the claims are afforded an effective filing date of 8 April 2004.

In response, Applicant has amended claim 44 to recite that the first RNA sequence is greater than 20 and up to 100 nucleotides in length. However, there is no support in the priority documents, or the specification as filed, for an upper limit of 100 bases for the length of the "first ribonucleotide (RNA) sequence". As a result the effective filing date for the instant claims remains 8 April 2004.

Applicant asserts at page 4 of the response that the phrase "at least 20 and up to 100 nucleotides" is supported by, and is a clear and reasonable interpretation of, the phrase "at least 20-100 nucleotides. This is unpersuasive for the reasons set forth in the previous paragraph, i.e. the specification actually teaches away from this interpretation by indicating that the nucleic acids of the invention should be greater than this range.

Oath/Declaration

The oath or declaration **stands objected to** as defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration was objected to because the application was filed with a copy of the declaration executed in the parent and does not reflect the status of the application as a continuation-in-part.

In response, Applicant contends that the amendments to the claims remove the subject matter identified as new matter and, therefore, the application is properly a continuation of the parent application. However, as described herein above, the application still contains subject matter that was not disclosed in the parent application and is therefore a continuation-in-part. Furthermore, even if all of the unsupported subject matter were removed from the claims, the application, as filed, is a continuation-in-part and will remain a continuation-in-part throughout prosecution. The critical distinction between new subject matter filed as part of an original disclosure and new matter that is not part of an original disclosure, is that any subject matter considered to be part of an original disclosure can be reintroduced and claimed during the prosecution of the instant application or in continuing applications that claim benefit of the instant application. Applicants must declare their belief that they are the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventors of the subject matter which is claimed and for which a patent is sought and, as

the subject matter at issue was not present when the Declaration filed with the parent application was signed, a copy of that Declaration does not suffice in the instant case.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

New Matter

Claims 44, 47, 48, and 56-61 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims have been amended to require that the first RNA sequence is "greater than 20 and up to 100 nucleotides in length." As discussed above, there is no support in the priority documents, or the specification as filed, for an upper limit of 100 bases for the length of the first RNA sequence. As a result the claims recite new matter.

Enablement

Claims 44, 47, 48, and 56-61 are under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for an isolated nucleic acid molecule comprising a first RNA sequence wherein said first RNA sequence is about 20-30 nucleotides in

length and a second RNA sequence wherein said second RNA sequence is about 20-30 nucleotides in length and complementary to said first RNA sequence, wherein the first nucleic acid molecule is identical to a sequence complementary to a region of a target gene, wherein said molecule is capable of effecting post-transcriptional repression, delay or otherwise reducing expression of a target gene in a mammalian cell, wherein the expression is reduced by sequence-specific degradation of an RNA transcript of the target gene by an endogenous system of the mammalian cell, does not reasonably provide enablement for such molecules that form double strands and are greater than 30 nucleotides in length. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

The claims embrace double stranded RNA molecules with duplex regions of from 20 to 100 base pairs in length that can reduce expression of a target gene by sequence-specific degradation of an RNA transcript of the target gene through an endogenous system of the mammalian cell. As such the claims read on small interfering RNA molecules used or RNA inhibition (RNAi).

The art teaches that obtaining specific RNAi in a mammalian cell using RNA molecules greater than about 30 nucleotides in length is highly unpredictable. For example, Lin *et al.* US Pub No. 2004/0106566 teaches (paragraph 0004; emphasis added, citations omitted),

> Although PTGS/RNAi phenomena appear to offer a potential avenue for inhibiting gene expression, their applications have not been demonstrated to work constantly in higher vertebrates and, therefore, the widespread use thereof in higher vertebrates is still questionable. For example, the findings of RNAi effects are based on the transfection use of double-

> stranded RNA (dsRNA), which have shown to cause interferon-induced non-specific RNA degradation in mammalian cells[]. Such an interferon-induced cellular response usually reduces the specificity of RNAi-associated gene silencing effects and may cause a severe cytotoxic side-effect to the transfected cells []. Especially in mammalian cells, it has been noted that the gene silencing effects of dsRNA-mediated RNAi phenomena are repressed by the interferon-induced global RNA degradation when the dsRNA size is larger than 25 base-pairs (bp).

Likewise, Verma *et al.* US Pub No. 2004/0234504 teaches, "[i]n most mammalian cells dsRNA provokes a non-specific cytotoxic response. In contrast, the introduction of siRNAs, as provided by the present invention, appears to suppress gene expression without producing a non-specific cytotoxic response because the small size of the siRNAs, as compared to dsDNA, prevents activation of the dsRNA-inducible interferon system in mammalian cells and avoids the non-specific phenotypes that can be observed by introducing larger dsRNA" (paragraph 0034; emphasis added). Also, Elbashir (Nature 411:494-498, 2001) taught that it was not possible to detect specific RNA interference in commonly used mammalian cell culture systems when applying dsRNA that varies in size between 38 and 1662 bp. See lines 4-9 of page 494, column 2.

Thus, the art clearly recognized that obtaining sequence-specific degradation of an RNA transcript of a target gene by an endogenous system of the mammalian cell becomes more unpredictable as the size of the inhibitory RNA molecule is increased. Therefore, claims 44, 47, 48 and 56-61 are clearly not enabled over their full scope.

The specification provides no guidance as to how to obtain sequence-specific degradation of an RNA transcript of the target gene through an endogenous system of

the mammalian cell through the use of an RNA duplex of greater than 30 bases, and has no working example of such a method.

In view of the state of the art at the time of the invention, the unpredictability in the art, and the failure to provide guidance or working examples, one of skill in the art would have to perform undue experimentation in order to use the invention as intended.

Note that the stated scope of enablement is not commensurate with is described by the specification as filed. More specifically, the specification as filed does not provide a written description for RNA sequences limited to 20-30 nucleotides in length. See e.g. page 2 of the Advisory Action mailed 9/14/05. As a result, an amendment to limit the claims to the enabled scope set forth above would result in the introduction of new matter.

Response to Arguments

Applicant's arguments filed 12/21/05 have been fully considered as they might apply to the ground of rejection set forth above but they are not persuasive.

Applicant's response at the paragraph bridging pages 5 and 6 is relevant to the rejection. Applicant argues that the art shows that dsRNAs longer than 30 bp have been used to achieve RNAi relying on Park (2002), Yamamoto (2002), Park (2001), Gitlin (2005), and Robbins (2005). This is unpersuasive for the following reasons.

Park (2002) acknowledges that the prior art taught that dsRNAs of longer than 30 bp appeared to be of limited utility in mammals for the same reasons discussed in the rejection. However, Park asserts that sequence-specific RNAi was achieved with

dsRNA of 531 bp targeted against HIV in COS cells. This assertion is contradicted by the evidence of Fig. 1 B which shows a significant inhibition of HIV production in response to siRNA directed against luciferase. It is noted that Fig. 4 on page 4833 provides evidence consistent with a specific effect. Fig. 4 shows RT-PCR products generated from cells treated with the 531 bp dsRNA vs cells treated with ssDNA or untreated cells. As a control Park performed RT-PCR on the unrelated G3PDH mRNA, which appears to be unaffected by the dsRNA treatment (compare lanes 2 and 4). However, this is not sufficient evidence to show that the dsRNA effect was sequence-specific. Elbashir (2001) taught that large dsRNA stimulates protein kinase R (PKR), leading to phosphorylation of transcription initiation factors and an inhibition of protein synthesis. This non-specific effect would not be detected by an assay of mRNA amounts, so Fig. 4 of Park is insufficient to allow one of skill in the art to conclude that there was a sequence-specific inhibitory effect.

In the Yamamoto reference a 500 bp dsRNA was used to inhibit HIV a nef-EGFP fusion mRNA in cultured mammalian cells.. However, Fig. 4 on page 813 shows that the observed inhibition was not sequence specific because it invariably resulted in inhibition of wild type EGFP mRNA. See columns 3, 5, 7, and 9 on the Fig. 4 histogram. So, contrary to Applicant's assertion, the Yamamoto reference supports the position of the Office.

The Park (2001) reference discloses the use six dsRNAs ranging from 448 to 531 bp in length to inhibit HIV gene expression in COS cells. However, Park presents no evidence that the effect observed was sequence-specific rather than due to PKR-

mediated, generalized inhibition of translation, and so cannot be relied upon to demonstrate that longer dsRNAs have sequence-specific effects in mammalian cells.

The Gitlin (2005) and Robbins (2005) references were published after the effective filing date of the instant application, and so are not available to establish the state of the art at the time of the invention with regard to what one of skill in the art would have believed regarding the effects of dsRNA in excess of 30 bp. See MPEP 2164.05(a). Furthermore, Gitlin obtained RNAi using long dsRNA in p19 cells which were used specifically because, in contrast to most mammalian cells, they are known to support RNAi by long dsRNA without the induction of an interferon response. See Gitlin at page 1032, column 2, lines 1-9. The instant claims are not limited to molecules that function only in P19 cells, but instead are broadly drawn to molecules that will function in any mammalian cell.

In summary, none of the cited references provides evidence that would persuade one of skill in the art at the time of the invention that one could obtain sequence-specific degradation of target gene RNA transcripts using dsRNA of longer than 30 bp. Instead, Park (2002) and Yamamoto (2002) provide evidence to the contrary, Gitlin (2005) supports the idea that most mammalian cells in general do not support sequence-specific degradation of target gene RNA transcripts using dsRNA of longer than 30 bp, and Park (2001) fails to exclude non-specific effects. For these reasons the rejection is maintained.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 44, 47, 48, and 56-61 **stand** rejected under 35 U.S.C. 102(a) as being anticipated by Harborth *et al.* (publicly available 12 May 2003) *Antisense Nucl. Acid Drug Devel.* 13:83-105.

Harborth *et al.* discloses a series of nucleic acids capable of post transcriptionally repressing delaying or otherwise reducing expression of a target gene in a mammalian cell when introduced into a mammalian cell, wherein the expression of the target gene is reduced by sequence specific degradation of a RNA transcript of the target gene by an endogenous system of a mammalian cell. The nucleic acid molecules of Harborth *et al.* are RNA molecules comprising a first sequence of about 20-100 nucleotides in length, wherein the sequence is 100% identical to a sequence complementary to a region of a target gene and a second RNA sequence wherein said second RNA sequence is complementary to said first RNA sequence (see especially Figures 7 and 9 and the captions thereto). The nucleic acid molecules of Harborth *et al.* anticipate the nucleic acids of the instant claims 44, 47, and 61.

Furthermore, Harborth *et al.* teaches nucleic acids comprised at least partially of ribonucleotide analogs according to claim 48 (Figure 7), teaches the molecule wherein the first RNA sequence is 24, 23, 22, 21, 20 or 19 nucleotides in length according to

claims 49-54 (Figure 7 and 9), teaches the molecule wherein the first and second RNA sequences are the same length according to claim 56 and 57 (Figure 7) and teaches the molecule wherein the first and second RNA sequences are in the same nucleic acid strand and separated by a nucleic acid stuffer according to claims 58 and 59 (Figure 9) or wherein the first and second RNA sequences are in separate nucleic acid strands according to claim 60.

Harborth *et al.* teaches nucleic acid molecules comprising each of the limitations of the instant claimed nucleic acid molecules. Therefore, the claims are anticipated by Harborth *et al.*

Claims 44, 47, 56, 57, 60, and 61 **stand** are rejected under 35 U.S.C. 102(b) as being anticipated by McManus *et al.* (2002) *RNA* 8:842-850.

McManus *et al.* discloses a series of nucleic acids capable of post transcriptionally repressing delaying or otherwise reducing expression of a target gene in a mammalian cell when introduced into a mammalian cell, wherein the expression of the target gene is reduced by sequence specific degradation of a RNA transcript of the target gene by an endogenous system of a mammalian cell. The nucleic acid molecules of McManus *et al.* are RNA molecules comprising a first sequence of about 20-100 nucleotides in length, wherein the sequence is 100% identical to a sequence complementary to a region of a target gene (*i.e.*, CD4 and CD8 genes) and a second RNA sequence wherein said second RNA sequence is complementary to said first RNA sequence (see especially Figures 1 and 4 and the captions thereto). The nucleic acid

molecules of McManus *et al.* anticipate the nucleic acids of the instant claims 44, 47, and 61.

Furthermore, McManus *et al.* teaches the molecule wherein the first and second RNA sequences are the same length according to claim 56 and 57 (Figure 1) and teaches the molecule wherein the first and second RNA sequences are in the same nucleic acid strand and separated by a nucleic acid stuffer according to claims 58 and 59 or wherein the first and second RNA sequences are in separate nucleic acid strands according to claim 60 (Figure 1).

McManus *et al.* teaches nucleic acid molecules comprising each of the limitations of the instant claimed nucleic acid molecules. Therefore, the claims are anticipated by McManus *et al.*

Claims 44, 47, 56, 57, 60 and 61 **stand** rejected under 35 U.S.C. 102(b) as being anticipated by Elbashir *et al.* (2002) *Methods* 26:199-213 (made of record in the IDS filed 2 August 2004).

Elbashir *et al.* discloses a series of nucleic acids capable of post transcriptionally repressing delaying or otherwise reducing expression of a target gene in a mammalian cell when introduced into a mammalian cell, wherein the expression of the target gene is reduced by sequence specific degradation of a RNA transcript of the target gene by an endogenous system of a mammalian cell. The nucleic acid molecules of Elbashir *et al.* are RNA molecules comprising a first sequence of about 20-100 nucleotides in length, wherein the sequence is 100% identical to a sequence complementary to a

region of a target gene (*i.e.*, GL2 luciferase) and a second RNA sequence wherein said second RNA sequence is complementary to said first RNA sequence (see especially Figure 5 and the caption thereto). The nucleic acid molecules of Elbashir *et al.* anticipate the nucleic acids of the instant claims 44, 47, and 61.

Furthermore, in Figure 1, *inter alia*, Elbashir *et al.* teaches the molecule wherein the first and second RNA sequences are the same length according to claim 56 and 57 and teaches the molecule wherein the first and second RNA sequences are in separate nucleic acid strands according to claim 60.

Elbashir *et al.* teaches nucleic acid molecules comprising each of the limitations of the instant claimed nucleic acid molecules. Therefore, the claims are anticipated by Elbashir *et al.*

Claims 44, 47, 48, 56-59, and 61 are rejected under 35 U.S.C. 102(b) as being anticipated by Agrawal et al (WO 94/01550, of record).

Agrawal taught self-stabilizing RNA molecules comprising a region that is complementary to a target in an mRNA and a region that is self-complementary. See abstract; page 8, lines 7-11 and 22-24, and page 13, lines 25-30. The target hybridizing region is from 8 to 50 nucleotides in length (sentence bridging pages 9 and 10. Every base in the oligonucleotide may be paired with a complementary base (see page 15, lines 23-30, which describes completely paired oligonucleotides up to 100 bases in length). Alternatively, the self complementary regions may be separated by an unpaired

loop structure (see e.g. Fig. 1). The oligonucleotides may contain ribonucleotide analogs (see page 8, lines 15-19 and page 13, lines 25-30).

Response to Arguments

Applicant's arguments filed 12/21/05 have been fully considered but they are not persuasive.

Applicant argues at pages 6 and 7 of the response that neither Harborth nor Elbashir teaches or suggests a siRNA that is an isolated nucleic acid comprising a first RNA sequence and a second RNA sequence, wherein the first RNA sequence and the second RNA sequence are transcription products of a construct comprising a transcription terminator sequence that is operable in a mammalian cell. This is unpersuasive. As discussed above, these references each teach an siRNA molecule that is an isolated nucleic acid comprising a first RNA sequence and a second RNA sequence. The functional language "wherein the first RNA sequence and the second RNA sequence are transcription products of a construct comprising a transcription terminator sequence that is operable in a mammalian cell" is product by process language that carries no patentable weight. Applicant has not pointed out how a transcription product of a construct comprising a transcription terminator sequence that is operable in a mammalian cell distinguishes in any way from the products of Harborth or Elbashir. Applicant has pointed to no structural difference between the cited art and the claims composition, and there is no apparent difference.

With regard to McManus, Applicant argues limitations that are not in the claims. Specifically, Applicant argues that the McManus fails to teach a "non-transcribed transcription terminator sequence", but this limitation is not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Also note that the instant specification at the paragraph bridging page 34 line 18, through the paragraph bridging pages 34 and 35, indicates that transcription terminators include poly A addition signals. Since poly A addition signals are transcribed sequences, it is clear that the specification as filed allows transcribed transcription terminator sequences.

Applicant's arguments that the instant Application is entitled to an earlier priority date are unpersuasive for the reasons set forth above under Priority and New Matter.

Conclusion

No claim is allowed.

Any inquiry concerning this communication or earlier communications from the examiner(s) should be directed to Richard Schnizer, whose telephone number is 571-272-0762. The examiner can normally be reached Monday through Friday between the hours of 6:00 AM and 3:30. The examiner is off on alternate Fridays, but is sometimes in the office anyway.

If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Peter Paras, can be reached at (571) 272-4517. The official central fax

number is 571-273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to (571) 272-0547.

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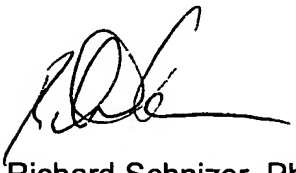

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